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DISTRIBUTION OF PHYTOPLANKTON IN DELAWARE LAKES

Environmental Monitoring and Support Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Las Vegas, Nevada 89114

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16. ABSTRACT

This is a data report presenting the species and abundance of phytoplankton in the 6 lakes sampled by the National Eutrophication Survey in the State of Delaware. Results from the calculation of several water quality indices are also included (Nygaard's Trophic State Index, Palmer's Organic Pollution Index, and species diversity and abundance indices).

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FOREWORD

Protection of the environment requires effective regulatory actions which are based on sound technical and scientific information. This information must include the quantitative description and linking of pollutant sources, transport mechanisms, interactions, and resulting effects on man and his environment. Because of the complexities involved, assessment of specific pollutants in the environment requires a total systems approach which transcends the media of air, water, and land. The Environmental Monitoring and Support Laboratory-Las Vegas contributes to the formation and enhancement of a sound integrated monitoring data base through multidisciplinary, multimedia programs designed to:

- develop and optimize systems and strategies for monitoring pollutants and their impact on the environment
- demonstrate new monitoring systems and technologies by applying them to fulfill special monitoring needs of the Agency's operating programs

This report presents the species and abundance of phytoplankton in the 6 lakes sampled by the National Eutrophication Survey in the State of Delaware, along with results from the calculation of several commonly used biological indices of water quality and community structure. These data can be used to biologically characterize the study lakes, and as baseline data for future investigations. This report was written for use by Federal, State, and local governmental agencies concerned with water quality analysis, monitoring, and/or regulation. Private industry and individuals similarly involved with the biological aspects of water quality will find the document useful. For further information contact the Water and Land Quality Branch, Monitoring Operations Division.

George B. Morgan
Director
Environmental Monitoring and Support Laboratory
Las Vegas

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INTRODUCTION

The collection and analysis of phytoplankton data were included in the National Eutrophication Survey in an effort to determine relationships between algal characteristics and trophic status of individual lakes.

During spring, summer, and fall of 1973, the Survey sampled 250 lakes in 17 States. Over 700 algal species and varieties were identified and enumerated from the 743 water samples examined.

This report presents the species and abundance of phytoplankton in the 6 lakes sampled in the State of Delaware (Table 1). The Nygaard's Trophic State (Nygaard 1949), Palmer's Organic Pollution (Palmer 1969), and species diversity and abundance indices are also included.

TABLE 1. LAKES SAMPLED IN THE STATE OF DELAWARE

STORET #	LAKE NAME	COUNTY
1002	Killen Pond	Kent
1005	Moores Lake (Pond)	Kent
1007	Noxontown Pond	New Castle
1008	Silver Lake	New Castle
1009	Williams Pond	Sussex
1010	Trussum Pond (Moores Pond)	Sussex

MATERIALS AND METHODS

LAKE AND SITE SELECTION

Lakes and reservoirs included in the Survey were selected through discussions with State water pollution agency personnel and U.S. Environmental Protection Agency Regional Offices (U.S. Environmental Protection Agency 1975). Screening and selection strongly emphasized lakes with actual or potential accelerated eutrophication problems. As a result, the selection was limited to lakes:

(1) impacted by one or more municipal sewage treatment plant outfalls either directly into the lake or by discharge to an inlet tributary within approximately 40 kilometers of the lake;

(2) 40 hectares or larger in size; and

(3) with a mean hydraulic retention time of at least 30 days.

Specific selection criteria were waived for some lakes of particular State interest.

Sampling sites for a lake were selected based on available information on lake morphometry, potential major sources of nutrient input, and on-site judgment of the field limnologist (U.S. Environmental Protection Agency 1975). Primary sampling sites were chosen to reflect the deepest portion of each major basin in a test lake. Where many basins were present, selection was guided by nutrient source information on hand. At each sampling site, a depth-integrated phytoplankton sample was taken. Depth-integrated samples were uniform mixtures of water from the surface to a depth of 15 feet (4.6 meters) or from the surface to the lower limit of the photic zone representing 1 percent of the incident light, whichever was greater. If the depth at the sampling site was less than 15 feet (4.6 meters), the sample was taken from just off the bottom to the surface. Normally, a lake was sampled three times in 1 year, providing information on spring, summer, and fall conditions.

SAMPLE PREPARATION

Four milliliters (ml) of Acid-Lugol's solution (Prescott 1970) were added to each 130-ml sample from each site at the time of collection for preservation. The samples were shipped to the Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, where equal volumes from each site were mixed to form two 130-ml composite samples for a given lake. One composite sample was put into storage and the other was used for the examination.

Prior to examination, the composite samples were concentrated by the settling method. Solids were allowed to settle for at least 24 hours prior to siphoning off the supernate. The volume of the removed supernate and the volume of the remaining concentrate were measured and concentrations determined. A small (8 ml) library subsample of the concentrate was then taken. The remaining concentrate was gently agitated to resuspend the plankton and poured into a capped, graduated test tube. If a preliminary examination of a sample indicated the need for a more concentrated sample, the contents of the test tube were further concentrated by repeating the settling method. Final concentrations varied from 15 to 40 times the original.

Permanent slides were prepared from concentrated samples after analysis was complete. A drop of superconcentrate from the bottom of the test tube was placed in a ring of clear Karo®Corn Syrup with phenol (a few crystals of phenol were added to each 100 ml of syrup) on a glass slide, thoroughly mixed, and topped with a coverglass. After the syrup at the edges of the coverglass had hardened, the excess was scraped away and the mount was sealed with clear fingernail polish. Permanent diatom slides were prepared by drying sample material on a coverglass, heating in a muffle furnace at 400° C for 45 minutes, and mounting in Hyrax®. Finally, the mounts were sealed with clear fingernail polish.

Backup samples, library samples, permanent sample slides, and Hyrax®-mounted diatom slides are being stored and maintained at the U.S. Environmental Monitoring and Support Laboratory-Las Vegas.

EXAMINATION

The phytoplankton samples were examined with the aid of binocular compound microscopes. A preliminary examination was performed to precisely identify and list all forms encountered. The length of this examination varied depending on the complexity of the sample. An attempt was made to find and identify all of the forms present in each sample. Often forms were observed which could not be identified to species or to genus. Abbreviated descriptions were used to keep a record of these forms (e.g., lunate cell, blue-green filament, Navicula #1). Diatom slides were examined using a standard light microscope. If greater resolution was essential to accurately identify the diatoms, a phase-contrast microscope was used.

After the species list was compiled, phytoplankton were enumerated using a Neubauer Counting Chamber with a 40X objective lens and a 10X ocular lens. All forms within each field were counted. The count was continued until a minimum of 100 fields had been viewed, or until the dominant form had been observed a minimum of 100 times.

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QUALITY CONTROL

Internal quality control checks on species identifications and counts were performed on a regular basis between project phycologists at the rate of 7 percent. Although an individual had primary responsibility for analyzing a sample, taxonomic problems were discussed among the phycologists.

Additional quality control checks were performed on the Survey samples by Dr. G. W. Prescott of the University of Montana at the rate of 5 percent. Quality control checks were made on 75 percent of these samples to verify species identifications while checks were made on the remaining 25 percent of the samples to verify genus counts. Presently, the agreement between quality control checks for species identification and genus enumerations is satisfactory.

RESULTS

The Appendix summarizes all of the phytoplankton data collected from the State by the Survey. It is organized by lake, including an alphabetical phytoplankton species list with concentrations for individual species given by sampling date. Results from the application of several indices are presented (Nygaard's Trophic State, Palmer's Organic Pollution, and species diversity and abundance). Each lake has been assigned a four digit STORET number. [STORET (STOrage and RETrieval) is the U.S. Environmental Protection Agency's computer system which processes and maintains water quality data.] The first two digits of the STORET number identify the State; the last two digits identify the lake.

NYGAARD'S TROPHIC STATE INDICES

Five indices devised by Nygaard (1949) were proposed under the assumption that certain algal groups are indicative of levels of nutrient enrichment. These indices were calculated in order to aid in determining the surveyed lakes' trophic status. As a general rule, Cyanophyta, Euglenophyta, centric diatoms, and members of the Chlorococcales are found in waters that are eutrophic (rich in nutrients), while desmids and many pennate diatoms generally cannot tolerate high nutrient levels and so are found in oligotrophic waters (poor in nutrients).

In applying the indices to the Survey data, the number of taxa in each major group was determined from the species list for each sample. The ratios of these groups give numerical values which can be used as a biological index of water richness. The five indices and the ranges of values each for Danish lakes by Nygaard for each trophic state are presented in Table 2. The appropriate symbol, (E) eutrophic and (O) oligotrophic, follows each calculated value in the tables in the Appendix. A question mark (?) was entered in these tables when the calculated value was within the range of both classifications.

PALMER'S ORGANIC POLLUTION INDICES

Palmer (1969) analyzed reports from 165 authors and developed algal pollution indices for use in rating water samples with high organic pollution. Two lists of organic pollution-tolerant forms were prepared, one containing 20 genera, the other, 20 species (Tables 3 and 4). Each form was assigned a pollution index number ranging from 1 for moderately tolerant forms to 6 for extremely tolerant forms. Palmer based the index numbers on occurrence records and/or where emphasized by the authors as being especially tolerant of organic pollution.

TABLE 2. NYGAARD'S TROPHIC STATE INDICES ADAPTED FROM HUTCHINSON (1967)

Index	Calculation	Oligotrophic	Eutrophic
Myxophycean	$\frac{\text{Myxophyceae}}{\text{Desmideae}}$	0.0-0.4	0.1-3.0
Chlorophycean	$\frac{\text{Chlorococcales}}{\text{Desmideae}}$	0.0-0.7	0.2-9.0
Diatom	$\frac{\text{Centric Diatoms}}{\text{Pennate Diatoms}}$	0.0-0.3	0.0-1.75
Euglenophyte	$\frac{\text{Euglenophyta}}{\text{Myxophyceae + Chlorococcales}}$	0.0-0.3	0.0-1.0
Compound	$\frac{\text{Myxophyceae + Chlorococcales + Centric Diatoms + Euglenophyta}}{\text{Desmideae}}$	0.0-1.0	1.2-25

TABLE 3. ALGAL GENUS POLLUTION INDEX (Palmer 1969)

Genus	Pollution Index
Anacystis	1
Ankistrodesmus	2
Chlamydomonas	4
Chlorella	3
Closterium	1
Cyclotella	1
Euglena	5
Gomphonema	1
Lepocinclis	1
Melosira	1
Micractinium	1
Navicula	3
Nitzschia	3
Oscillatoria	5
Pandorina	1
Phacus	2
Phormidium	1
Scenedesmus	4
Stigeoclonium	2
Synedra	2

TABLE 4. ALGAL SPECIES POLLUTION INDEX (Palmer 1969)

Species	Pollution Index
Ankistrodesmus falcatus	3
Arthrospira jenneri	2
Chlorella vulgaris	2
Cyclotella meneghiniana	2
Euglena gracilis	1
Euglena viridis	6
Gomphonema parvulum	1
Melosira varians	2
Navicula cryptocephala	1
Nitzschia acicularis	1
Nitzschia palea	5
Oscillatoria chlorina	2
Oscillatoria limosa	4
Oscillatoria princeps	1
Oscillatoria putrida	1
Oscillatoria tenuis	4
Pandorina morum	3
Scenedesmus quadricauda	4
Stigeoclonium tenue	3
Syndra ulna	3

In analyzing a water sample, any of the 20 genera or species of algae present in concentrations of 50 per milliliter or more are recorded. The pollution index numbers of the algae present are totaled, providing a genus score and a species score. Palmer determined that a score of 20 or more for either index can be taken as evidence of high organic pollution, while a score of 15 to 19 is taken as probable evidence of high organic pollution. Lower figures suggest that the organic pollution of the sample is not high, that the sample is not representative, or that some substance or factor interfering with algal persistence is present and active.

SPECIES DIVERSITY AND ABUNDANCE INDICES

"Information content" of biological samples is being used commonly by biologists as a measure of diversity. Diversity in this connection means the degree of uncertainty attached to the specific identity of any randomly selected individual. The greater the number of taxa and the more equal their proportions, the greater the uncertainty, and hence, the diversity (Pielou 1966). There are several methods of measuring diversity, e.g., the formulas given by Brillouin (1962) and Shannon and Weaver (1963). The method which is appropriate depends on the type of biological sample on hand.

Pielou (1966) classifies the types of biological samples and gives the measure of diversity appropriate for each type. The Survey phytoplankton samples are what she classifies as larger samples (collections in Pielou's terminology) from which random subsamples can be drawn. According to Pielou, the average diversity per individual for these types of samples can be estimated from the Shannon-Wiener formula (Shannon and Weaver 1963):

$$H = -\sum_{i=1}^{S} P_i \log_x P_i$$

where P is the proportion of the ith taxon in the sample, which is calculated from n_i/N; n_i is the number of individuals per milliliter of the ith taxon; N is the total number of individuals per ml; and S is the total number of taxa.

However, Basharin (1959) and Pielou (1966) have pointed out that H calculated from the subsample is a biased estimator of the sample H, and if this bias is to be accounted for, we must know the total number of taxa present in the sample since the magnitude of this bias depends on it.

Pielou (1966) suggests that if the number of taxa in the subsample falls only slightly short of the number in the larger sample, no appreciable error will result in considering S, estimated from the subsample, as being equal to the sample value. Even though considerable effort was made to find and identify all taxa, the Survey samples undoubtedly contain a fair number of rare phytoplankton taxa which were not encountered.

In the Shannon-Wiener formula, an increase in the number of taxa and/or an increase in the evenness of the distribution of individuals among taxa will increase the average diversity per individual from its minimal value of zero. Sager and Hasler (1969) found that the richness of taxa was of minor importance in determination of average diversity per individual for phytoplankton and they concluded that phytoplankton taxa in excess of the 10 to 15 most abundant ones have little effect on H, which was verified by our own calculations. Our counts are in number per milliliter and since logarithms to the base 2 were used in our calculations, H is expressed in units of bits per individual. When individuals of a taxon were so rare that they were not counted, a value of 1/130 per milliliter or 0.008 per milliliter was used in the calculations since at least one individual of the taxon must have been present in the collection.

A Survey sample for a given lake represents a composite of all phytoplankton collected at different sampling sites on a lake during a given sampling period. Since the number of samples (M) making up a composite is a function of both the complexity of the lake sampled and its size, it should affect the richness-of-taxa component of the diversity of our phytoplankton collections. The maximum diversity (MaxH) (i.e., when the individuals are distributed among the taxa as evenly as possible) was estimated from $\log_2 S$, the total diversity (D) was calculated from HN, and the evenness component of diversity (J) was estimated from H/MaxH (Pielou 1966). Also given in the Appendix are L (the mean number of individuals per taxa per milliliter) and K (the number of individuals per milliliter of the most abundant taxon in the sample).

Zand (1976) suggests that diversity indices be expressed in units of "sits", i.e., in logarithms to base S (where S is the total number of taxa in the sample) instead of in "bits", i.e., in logarithms to base 2. Zand points out that the diversity index in sits per individual is a normalized number ranging from 1 for the most evenly distributed samples to 0 for the least evenly distributed samples. Also, it can be used to compare different samples, independent of the number of taxa in each. The diversity in bits per individual should not be used in direct comparisons involving various samples which have different numbers of species. Since MaxH equals log S, the expression in sits is equal to $\log_S S$, or 1. Therefore diversity in sits per individual is numerically equivalent to J, the evenness component for the Shannon-Wiener formula.

SPECIES OCCURRENCE AND ABUNDANCE

The alphabetic phytoplankton species list for each lake, presented in the Appendix, gives the concentrations of individual species by sampling date. Concentrations are in cells, colonies, or filaments (CEL, COL, FIL) per milliliter. An "X" after a species name indicates the presence of the species on that date in such a low concentration that it did not show up in the count. A blank space indicates that the organism was not found in the sample collected on that date. Column S is used to designate the examiner's subjective opinion of the five dominant taxa in a sample, based upon relative size and concentration of the organism. The percent column (%C) presents, by abundance, the percentage composition of each taxon.

LITERATURE CITED

Basharin, G. P. 1959. On a statistical estimate for the entrophy of a sequence of independent random variables, pp. 333-336. In N. Artin (ed.), Theory of Probability and Its Applications (translation of "Teoriya Veroyatnose i ee Premeneniya") 4. Society for Industrial and Applied Mathematics, Philadelphia.

Brillouin, L. 1962. Science and Information Theory (2nd ed.). Academic Press, New York. 351 pp.

Hutchinson, G. E. 1967. A Treatise on Limnology. II. Introduction to Lake Biology and the Limnoplankton. John Wiley and Sons, Inc., New York. 1,115 pp.

Nygaard, G. 1949. Hydrobiological studies of some Danish ponds and lakes. II. (K danske Vidensk. Selsk.) Biol. Sci. 7:293.

Palmer, C. M. 1969. A composite rating of algae tolerating organic pollution. J. Phycol. 5:78-82.

Pielou, E. C. 1966. The measurement of diversity in different types of biological collections. J. Theor. Biol. 13:131-144.

Prescott, G. W. 1970. How to Know the Freshwater Algae. William C. Brown Company, Dubuque. 348 pp.

Sager, P. E. and A.D. Hasler. 1969. Species diversity in lacustrine phytoplankton. I. The components of the index of diversity from Shannon's formula. Amer. Natur. 103(929):51-59.

Shannon, C. E. and W. Weaver. 1963. The Mathematical Theory of Communication. University of Illinois Press, Urbana. 117 pp.

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. Environmental Monitoring and Support Laboratory. Las Vegas, Nevada, and Corvallis Environmental Research Laboratory, Corvallis, Oregon. 91 pp.

Zand, S. M. 1976. Indexes associated with information theory in water quality. Journal WPCF. 48(8):2026-2031.

APPENDIX. SUMMARY OF PHYTOPLANKTON DATA

This appendix was generated by computer. Because it was only possible to use upper case letters in the printout, all scientific names are printed in upper case and are not italicized.

The alphabetic phytoplankton lists include taxa without species names (e.g., EUNOTIA, EUNOTIA #1, FLAGELLATE, FLAGELLATES, MICROSYSTIS INCERTA ?, CHLOROPHYTAN COCCOID CELLED COLONY). When species determinations were not possible, symbols or descriptive phrases were used to separate taxa for enumeration purposes. Each name on a list, however, represents a unique species different from any other name on the same list, unless otherwise noted, for counting purposes.

Numbers were used to separate unidentified species of the same genus. A generic name listed alone is also a unique species. A question mark (?) is placed immediately after the portion of a name which was assigned with uncertainty. Numbered, questioned, or otherwise designated taxa were established on a lake-by-lake basis; therefore NAVICULA #2 from lake A cannot be compared to NAVICULA #2 from lake B. Pluralized categories (e.g., FLAGELLATES, CENTRIC DIATOMS, SPP.) were used for counting purposes when taxa could not be properly differentiated on the counting chamber.

LAKE NAME: KILLEN POND
STORET NUMBER: 1002

NYGAARD TROPHIC STATE INDICES

DATE	07 20 73	09 28 73
MYXOPHYCEAN	04/0 E	04/0 E
CHLOROPHYCEAN	05/0 E	11/0 E
EUGLENOPHYTE	0/09 ?	0/15 ?
DIATOM	01/0 E	0.43 E
COMPOUND	10/0 E	18/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	07 20 73	09 28 73
GENUS	12	11
SPECIES	04	04

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		07 20 73	09 28 73
AVERAGE DIVERSITY	H	1.70	2.91
NUMBER OF TAXA	S	10.00	30.00
NUMBER OF SAMPLES COMPOSITED	M	1.00	1.00
MAXIMUM DIVERSITY	MAXH	3.32	4.91
TOTAL DIVERSITY	D	9480.90	64774.60
TOTAL NUMBER OF INDIVIDUALS/ML	N	5577.00	22260.00
EVENESS COMPONENT	J	0.51	0.59
MEAN NUMBER OF INDIVIDUALS/TAXA	L	557.70	742.00
NUMBER/ML OF MOST ABUNDANT TAXON	K	2853.00	6395.00

LAKE NAME: KILLEN POND
STORET NUMBER: 1002

CONTINUED

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
ACHNANTHES LANCEOLATA V. CUBIA	CEL						X
CHLAMYDOMONAS	CEL						X
COELASTRUM CAMBRICUM	COL					0.3	63
CRYPTOMONAS	CEL				4	4.8	1066
CYANOPHYTAN FILAMENT	FIL	4	4.4	247		1.1	251
CYCLOTELLA STELLIGERA	CEL					0.3	63
DICTYOSPHAERIUM PULCHELLUM	COL			X			
EUDORINA	COL					0.3	63
EUDORINA ELEGANS	COL						X
EUNOTIA FLEXUOSA	CEL						X
FLAGELLATES	CEL					3.4	752
MELOSIRA #2	CEL	5	2.0	110		3.7	815
MELOSIRA DISTANS	CEL						X
MICROCYSTIS AERUGINOSA	COL	1	51.2	2858	1	26.2	5831
NAVICULA CONFERVACEA	CEL						X
NAVICULA MINIMA	CEL						X
NAVICULA RHYNCHOCEPHALA	CEL						X
NITZSCHIA #1	CEL				2	28.7	6395
NITZSCHIA #2	CEL						X
OOCYSTIS	CEL					2.3	502
OOCYSTIS PARVA ?	CEL						X
OSCILLATORIA SUBBREVIS	FIL	3	5.9	330			X
PEDIASTRUM DUPLEX V. ?	COL			X			
PEDIASTRUM DUPLEX V. RETICULATUM	COL					0.3	63
PEDIASTRUM TETRAS V. TETRAODON	COL						X
PHORMIDIUM MUCICOLA	COL		34.5	1923		13.2	2947
SCENEDESMUS	COL		0.5	27			
SCENEDESMUS ABUNDANS	COL				5	10.1	2257

LAKE NAME: KILLEN POND CONTINUED
STORET NUMBER: 1002

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
SCENEDESMUS BICAUDATUS	COL					2.8	627
SCENEDESMUS BIJUGA	COL					0.3	63
SCENEDESMUS DISPAR	COL					1.1	251
SCENEDESMUS QUADRICAUDA	COL		1.5	82		0.8	188
SCHROEDERIA SETIGERA	CEL			X		0.3	63
TOTAL				5577			22260

LAKE NAME: MOORES LAKE
STORET NUMBER: 1005

NYGAARD TROPHIC STATE INDICES

DATE	07 20 73	09 28 73
MYXOPHYCEAN	1.00 E	1.33 E
CHLOROPHYCEAN	7.00 E	9.67 E
EUGLENOPHYTE	0.09 ?	0.06 ?
DIATOM	1.25 E	1.00 E
COMPOUND	10.0 E	14.0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	07 20 73	09 28 73
GENUS	22	19
SPECIES	04	11

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		07 20 73	09 28 73
AVERAGE DIVERSITY	H	2.37	2.88
NUMBER OF TAXA	S	55.00	53.00
NUMBER OF SAMPLES COMPOSITED	M	1.00	1.00
MAXIMUM DIVERSITY	MAXH	5.78	5.73
TOTAL DIVERSITY	D	158176.17	300548.16
TOTAL NUMBER OF INDIVIDUALS/ML	N	66741.00	104357.00
EVENESS COMPONENT	J	0.41	0.50
MEAN NUMBER OF INDIVIDUALS/TAXA	L	1213.47	1969.00
NUMBER/ML OF MOST ABUNDANT TAXON	K	39004.00	48693.00

LAKE NAME: MOORES LAKE
STORET NUMBER: 1005

CONTINUED

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
ACTINASTRUM HANTZSCHII	COL		4.0	2646		1.5	1600
ANABAENA	FIL					0.7	686
ANKISTRODESMUS	CEL		0.1	85			
ASTERIONELLA	CEL						X
ASTERIONELLA FORMOSA	CEL					0.4	457
ATTHEYA ZACHARIASI	CEL						X
CARTERIA	CEL			X			
CHLAMYDOMONAS #1	CEL			X			
CHLAMYDOMONAS #2	CEL			X			
COELASTRUM	COL					0.3	342
COELASTRUM SPHAERICUM	COL			X			
COSMARIUM	CEL			X			X
CRUCIGENIA	COL		0.1	85			
CRUCIGENIA APICULATA	COL			X	5	3.2	3315
CRYPTOMONAS	CEL	4	5.6	3756			
CYANOPHYTAN FILAMENT	FIL		0.3	171		0.5	572
CYCLOTELLA	CEL		0.5	342			
CYCLOTELLA MENEGHINIANA	CEL				3	5.0	5258
CYCLOTELLA STELLIGERA	CEL		1.4	939			
DICTYOSPHAERIUM PULCHELLUM	COL						X
EUDORINA ELEGANS	COL			X			
EUGLENA	CEL		0.1	85		0.2	229
EUGLENA #1	CEL		0.1	85			
EUNOTIA INCISA	CEL						X
FLAGELLATES	CEL	3	9.3	6231		2.3	2400
FRAGILARIA	CEL			X			
FRANCEIA DROESCHERI	CEL					0.2	229
FRUSTULIA RHOMBOIDES V. SAXONICA	CEL						X
GOLENKINIA	CEL						X
GOLENKINIA RADIATA	CEL			X			
GOMPHONEMA ACUMINATUM V. CORONATA	CEL						X

LAKE NAME: MOORES LAKE
STORET NUMBER: 1005

CONTINUED

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
MELOSIRA ? #4	CEL				4	3.9	4115
MELOSIRA #2	CEL	1	58.4	39004	1	46.7	48693
MELOSIRA #4	CEL	2	9.5	6316			
MELOSIRA DISTANS	CEL	5	4.1	2731		2.0	2057
MELOSIRA VARIANS	CEL						X
MERISMOPEDIA MINIMA	COL		0.5	342			
MICRACTINIUM	COL		0.1	85			
MICRACTINIUM PUSILLUM	COL					0.5	572
MICROCYSTIS AERUGINOSA	COL					0.1	114
MICROCYSTIS INCERTA	COL			X		0.1	114
MOUGEOTIA ?	FIL			X			
NAVICULA	CEL			X		0.1	114
NITZSCHIA	CEL		0.1	85			
NITZSCHIA PALEA	CEL					1.8	1829
OSCILLATORIA	FIL		0.1	85			
PEDIASTRUM DUPLEX V. CLATHRATUM	COL			X			X
PEDIASTRUM DUPLEX V. RETICULATUM	COL			X		0.1	114
PEDIASTRUM SIMPLEX	COL					0.1	114
PEDIASTRUM TETRAS V. TETRADON	COL			X			X
PENNATE DIATOM	CEL		0.1	85			
PHACUS	CEL						X
SCENEDESMUS	COL		0.9	557			
SCENEDESMUS ABUNDANS	COL		0.5	342		0.7	686
SCENEDESMUS ACUMINATUS	COL			X		0.2	229
SCENEDESMUS BICAUDATUS	COL					0.3	342
SCENEDESMUS BIJUGA	COL			X		1.6	1715
SCENEDESMUS DISPAR	COL					0.5	572
SCENEDESMUS ECORNIS V. DISCIFORMIS	COL		0.1	85			

LAKE NAME: MOORES LAKE
STORET NUMBER: 1005

CONTINUED

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
SCENEDESMUS INTERMEDIUS V. BICAUDATUS	COL		1.0	683		1.8	1829
SCENEDESMUS OPOLIENSIS	COL		0.1	85		1.2	1257
SCENEDESMUS QUADRICAUDA	COL		1.7	1109		1.0	1029
SCHROEDERIA SETIGERA	CEL		0.3	171		0.2	229
SELENASTRUM WESTII	COL		0.1	85			
SELENASTRUM WESTII ?	COL					0.1	114
STAURASTRUM #1	CEL			X		0.1	114
STAURASTRUM #2	CEL			X			
STAURASTRUM PARADOXUM	CEL			X		0.1	114
STEPHANODISCUS	CEL				2	21.0	21946
TETRAEDRON #1	CEL					0.2	229
TETRAEDRON #2	CEL		0.1	85		0.7	00686
TETRAEDRON #3	CEL			X			
TETRAEDRON CAUDATUM	CEL		0.3	171			
TETRAEDRON MINIMUM	CEL		0.1	85			X
TETRAEDRON MUTICUM	CEL		0.1	85			
TETRAEDRON PLANCTONICUM	CEL			X		0.3	342
TETRAEDRON TRIGONUM V. GRACILE	CEL						X
TETRASTRUM HETERACANTHUM	COL			X			X
TETRASTRUM STAUROGENIAEFORME	COL						X
TRACHELOMONAS SIMILIS	CEL			X			
TREUBARIA	CEL			X			X
TOTAL				66741			104357

LAKE NAME: NOXONTOWN POND
STORET NUMBER: 1007

NYGAARD TROPHIC STATE INDICES

DATE	04 10 73	07 20 73	09 29 73
MYXOPHYCEAN	0/01 C	2.00 E	1.40 E
CHLOROPHYCEAN	4.00 E	8.67 E	5.80 E
EUGLENOPHYTE	1.50 E	0.22 E	0.22 E
DIATOM	0.83 E	05/0 E	3.00 E
COMPOUND	15.0 E	14.6 E	10.0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 10 73	07 20 73	09 29 73
GENUS	14	14	17
SPECIES	00	04	06

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		04 10 73	07 20 73	09 29 73
AVERAGE DIVERSITY	H	2.74	4.08	4.21
NUMBER OF TAXA	S	27.00	52.00	60.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00	2.00
MAXIMUM DIVERSITY	MAXH	4.75	5.70	5.91
TOTAL DIVERSITY	D	84816.70	45732.72	57563.33
TOTAL NUMBER OF INDIVIDUALS/ML	N	30955.00	11209.00	13673.00
EVENESS COMPONENT	J	0.58	0.72	0.71
MEAN NUMBER OF INDIVIDUALS/TAXA	L	1146.48	215.56	227.88
NUMBER/ML OF MOST ABUNDANT TAXON	K	8411.00	2265.00	2362.00

LAKE NAME: NOXONTOWN POND
STORET NUMBER: 1007

CONTINUED

TAXA	FORM	04 10 73 S	04 10 73 %C	04 10 73 ALGAL UNITS PER ML	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
ANABAENA	FIL								1.1	151
ASTERIONELLA FORMOSA										
V. GRACILLIMA	CEL	4	6.6	2056						
CLOSTERIDIUM	CEL			X						
CLOSTERIUM	CEL					1.7	189		0.7	101
COELASTRUM RETICULATUM	COL					0.7	75			
COELASTRUM SPHAERICUM	COL					0.3	38		1.8	251
COELOSPHAERIUM COLLINSII ?	COL								2.2	302
COSMARIUM	CEL						X		1.5	201
CRUCIGENIA APICULATA	COL					3.0	340		2.2	302
CRUCIGENIA TETRAPEDIA	COL						X			
CRYPTOMONAS	CEL		3.6	1122						
CRYPTOMONAS #1	CEL				3	12.8	1434			
CYANOPHYTAN FILAMENT #1	FIL						X		4.4	603
CYANOPHYTAN FILAMENT #2	FIL						X			X
CYANOPHYTAN FILAMENT #3	FIL					1.3	151			
CYCLOTELLA #1	CEL					0.3	38			
CYCLOTELLA #2	CEL						X			
CYCLOTELLA MENEGHINIANA	CEL								2.6	352
CYCLOTELLA STELLIGERA	CEL			X					1.5	201
CYMBELLA TURGIDA	CEL			X						
DACTYLOCOCCOPSIS	CEL					3.4	377		2.6	352
DICTYOSPHAERIUM PULCHELLUM	COL								1.1	151
DINOBRYON	CEL			X						
DINOFLAGELLATE	CEL		0.6	194						
DINOFLAGELLATE #1	CEL						X			X
DINOFLAGELLATE #2	CEL					1.0	113			
ELAKATOTHRIX	COL						X			
EUASTRUM	CEL									X
EUGLENA	CEL		0.6	187						
EUGLENA #1	CEL			X			X		1.5	201
EUGLENA #2	CEL			X		3.7	415			

LAKE NAME: NOXONTOWN POND
STORET NUMBER: 1007

CONTINUED

TAXA	FORM	04 10 73 S	04 10 73 %C	04 10 73 ALGAL UNITS PER ML	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
EUGLENA ACUS	CEL									X
EUGLENA ACUTISSIMA	CEL									X
FLAGELLATES	CEL	5	8.2	2523	1	20.2	2265	5	9.6	1307
GOLENKINIA PAUCISPINA	CEL						X			
GYROSIGMA SPENCERII	CEL		0.6	194						
KIRCHNERIELLA	CEL									X
KIRCHNERIELLA LUNARIS	CEL					0.7	75			
KIRCHNERIELLA LUNARIS V. IRREGULARIS	CEL						X			
LAGERHEIMIA SUBSALSA	CEL						X			X
LUNATE CELL	CEL		0.9	280						
MALLOMONAS	CEL								0.4	50
MALLOMONAS PSEUDOCORONATA	CEL						X			
MELOSIRA #2	CEL	1	27.2	8411		3.0	340		2.6	352
MELOSIRA #5	CEL				4	6.4	717	4	5.5	754
MELOSIRA DISTANS	CEL	3	22.6	7009	2	13.1	1472	2	17.3	2362
MERISMOPEDIA MINIMA	COL					0.3	38			
MERISMOPEDIA TENUISSIMA	COL									X
MICROCYSTIS INCERTA	COL					2.4	264		2.2	302
OOCYSTIS	CEL					1.0	113		1.5	201
PEDIASTRUM BIRADIATUM V. LONGECORNUTUM	COL									X
PEDIASTRUM BORYANUM	COL						X			
PEDIASTRUM DUPLEX V. RETICULATUM	COL					0.3	38			X
PEDIASTRUM SIMPLEX	COL			X						X
PEDIASTRUM SIMPLEX V. DUODENARIUM	COL						X			
PEDIASTRUM TETRAS V. TETRAODON	COL					0.3	38			
PENNATE DIATOM	CEL			X						
PHACUS	CEL									X

LAKE NAME: NOXONTOWN POND
STORET NUMBER: 1C07

CONTINUED

TAXA	FORM	04 10 73 S	04 10 73 %C	04 10 73 ALGAL UNITS PER ML	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
PHACUS #1	CEL		0.6	187			X		1.1	151
PHACUS #2	CEL			X						
PHACUS HELIKOIDES	CEL								0.4	50
PHACUS LONGICAUDA	CEL					0.7	75			X
PHACUS PYRUM	CEL									X
PHACUS TORTUS	CEL			X						
RHIZOSOLENIA	CEL			X						
RHIZOSOLENIA ERIENSIS	CEL								1.5	201
SCENEDESMUS	COL		1.8	561						
SCENEDESMUS #1	COL									X
SCENEDESMUS #2	COL			X						
SCENEDESMUS ABUNDANS	COL					0.3	38		1.1	151
SCENEDESMUS ABUNDANS V. BICAUDATUS	COL						X			X
SCENEDESMUS ACUMINATUS	COL									X
SCENEDESMUS BICAUDATUS	COL								0.4	50
SCENEDESMUS BIJUGA	COL					3.4	377	3	11.8	1608
SCENEDESMUS DISPAR	COL					0.7	75			
SCENEDESMUS GRANULATUS F. DISCIFORMIS	COL									X
SCENEDESMUS INTERMEDIUS V. BICAUDATUS	COL									X
SCENEDESMUS OPOLIENSIS	COL								0.4	50
SCENEDESMUS QUADRICAUDA	COL					2.7	302		2.2	302
SCHROEDERIA SETIGERA	CEL					1.7	189			
SPHAEROCYSTIS	COL				5	6.7	755			
STAURASTRUM	CEL									X
STAURASTRUM #2	CEL					0.7	75			
STAURASTRUM PARADOXUM ?	CEL		0.6	194						X
STEPHANODISCUS	CEL			X						
SYNEDRA #1	CEL	2	23.6	7290					4.0	553
SYNEDRA ACUS	CEL		2.4	747						

LAKE NAME: NOXONTOWN POND CONTINUED
STORET NUMBER: 1007

TAXA	FORM	04 10 73 S	%C	ALGAL UNITS PER ML	07 20 73 S	%C	ALGAL UNITS PER ML	09 29 73 S	%C	ALGAL UNITS PER ML
SYNEDRA DELICATISSIMA	CEL							1	12.5	1709
TETRAEDRON #1	CEL								0.7	101
TETRAEDRON #3	CEL									X
TETRAEDRON #4	CEL									X
TETRAEDRON LIMNETICUM	CEL						X			
TETRAEDRON MINIMUM										
V. SCROBICULATUM	CEL					0.3	38		0.7	101
TETRAEDRON MUTICUM	CEL								0.4	50
TETRAEDRON PENTAEDRICUM	CEL								0.4	50
TETRAEDRON PLANCTONICUM	CEL									X
TETRAEDRON TRIGONUM	CEL									X
TETRAEDRON TRIGONUM										
V. GRACILE	CEL					0.3	38			
TETRASTRUM HETERACANTHUM	COL					0.3	38			X
TRACHELOMONAS #1	CEL					2.7	302			
TRACHELOMONAS #2	CEL					2.4	264			
TRACHELOMONAS GRANULOSA	CEL					0.7	75			
TREUBARIA	CEL					0.3	38		0.4	50
TOTAL				30955			11209			13673

LAKE NAME: SILVER LAKE
STORET NUMBER: 1008

NYGAARD TROPHIC STATE INDICES

DATE	07 20 73	09 29 73
MYXOPHYCEAN	1.00 E	0/03 O
CHLOROPHYCEAN	22.0 E	3.33 E
EUGLENOPHYTE	0.09 ?	0.10 ?
DIATOM	1.50 E	0.50 E
COMPOUND	28.0 E	4.00 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	07 20 73	09 29 73
GENUS	13	04
SPECIES	06	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		07 20 73	09 29 73
AVERAGE DIVERSITY	H	2.70	2.03
NUMBER OF TAXA	S	34.00	18.00
NUMBER OF SAMPLES COMPOSITED	M	1.00	1.00
MAXIMUM DIVERSITY	MAXH	5.09	4.17
TOTAL DIVERSITY	D	57512.70	5915.42
TOTAL NUMBER OF INDIVIDUALS/ML	N	21301.00	2914.00
EVENESS COMPONENT	J	0.53	0.49
MEAN NUMBER OF INDIVIDUALS/TAXA	L	626.50	161.89
NUMBER/ML OF MOST ABUNDANT TAXON	K	11031.00	1623.00

LAKE NAME: SILVER LAKE
STORET NUMBER: 1009

CONTINUED

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
ANKISTRODESMUS	CEL		1.9	411			
CARTERIA	CEL		0.8	176			
CHLOROPHYTAN CELL	CEL		3.9	921			
CLOSTERIUM	CEL						X
COELASTRUM	COL		0.3	59			
COELASTRUM RETICULATUM	COL				2	9.6	279
COSMARIUM #1	CEL			X		3.5	101
CRUCIGENIA APICULATA	COL			X			
CYCLOTELLA	CEL		2.5	528			X
CYCLOTELLA MENEGHINIANA	CEL	5	2.2	469			
CYCLOTELLA STELLIGERA	CEL		2.8	587			
DICTYOSPHAERIUM PULCHELLUM	COL		0.3	59			
EUGLENA #1	CEL						X
EUGLENA #2	CEL	5		X			
FLAGELLATES	CEL	1	31.8	11031	3	20.9	609
GOLENKINIA	CEL		1.1	235			
LAGERHEIMIA CITRIFORMIS	CEL			X			
LAGERHEIMIA LONGISETA	CEL		0.8	176			
MICRACTINIUM	COL	2	11.6	2464			
NITZSCHIA #1	CEL	4	6.6	1408			X
OOCYSTIS	CEL			X		2.6	76
OSCILLATORIA	FIL			X			
PEDIASTRUM BORYANUM	COL		0.3	59		0.9	25
PEDIASTRUM DUPLEX V. CLATHRATUM	COL						X
PEDIASTRUM DUPLEX V. RETICULATUM	COL		0.3	59			
PEDIASTRUM TETRAS V. TETRAODON	COL		0.3	59			
SCENEDESMUS ABUNDANS	COL					0.9	25
SCENEDESMUS ACUMINATUS	COL		0.3	59			X
SCENEDESMUS ANOMALUS	COL		1.9	411		0.9	25

LAKE NAME: SILVER LAKE
STORET NUMBER: 1C09

CONTINUED

TAXA	FORM	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
SCENEDESMUS BICAUDATUS	COL					0.9	25
SCENEDESMUS DISPAR	COL			X	1	55.7	1623
SCENEDESMUS OPOLIENSIS	COL			X			
SCENEDESMUS QUADRICAUDA	COL		1.1	235			
SCHROEDERIA	CEL	3	8.0	1702			
SCHROEDERIA SETIGERA	CEL			X			
STAURASTRUM #1	CEL						
SYNEDRA #1	CEL				4	3.5	101
SYNEDRA #2	CEL		0.3	59			
TETRAEDRON LIMNETICUM	CEL						X
TETRAEDRON MUTICUM	CEL			X			
TETRAEDRON PENTAEDRICUM	CEL		0.5	117		0.9	25
TRACHELOMONAS	CEL			X			
	CEL		0.5	117			
TOTAL				21301			2914

LAKE NAME: WILLIAMS POND
STORET NUMBER: 1C09

NYGAARD TROPHIC STATE INDICES

DATE	04 10 73	07 20 73	09 28 73
MYXOPHYCEAN	0/01 C	0.75 E	2.20 E
CHLOROPHYCEAN	6.00 E	2.50 E	4.20 E
EUGLENOPHYTE	0/06 ?	0.08 ?	0.22 E
DIATOM	0.50 E	1.00 E	0.57 E
COMPOUND	9.00 E	3.87 E	8.60 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 10 73	07 20 73	09 28 73
GENUS	05	11	19
SPECIES	00	00	04

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		04 10 73	07 20 73	09 28 73
AVERAGE DIVERSITY	H	2.37	3.08	3.80
NUMBER OF TAXA	S	20.00	49.00	60.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00	2.00
MAXIMUM DIVERSITY	MAXH	4.32	5.61	5.91
TOTAL DIVERSITY	D	19962.51	104424.32	22663.20
TOTAL NUMBER OF INDIVIDUALS/ML	N	8423.00	33904.00	5964.00
EVENESS COMPONENT	J	0.55	0.55	0.64
MEAN NUMBER OF INDIVIDUALS/TAXA	L	421.15	691.92	99.40
NUMBER/ML OF MOST ABUNDANT TAXON	K	3438.00	8060.00	1484.00

LAKE NAME: WILLIAMS POND
STORET NUMBER: 1009

CONTINUED

TAXA	FORM	04 10 73 S	04 10 73 %C	04 10 73 ALGAL UNITS PER ML	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
ANABAENA	FIL								0.9	56
ANABAENA #1	FIL					1.5	516			
ANABAENA #2	FIL					2.7	930			
ANKISTRODESMUS FALCATUS	CEL		0.5	43						
APHANOTHECE	COL									X
ASTERIONELLA	CEL									X
ASTERIONELLA FORMOSA	CEL	3	17.9	1504						
CHLAMYDOMONAS	CEL						X			
CHLAMYDOMONAS GLOBOSA ?	CEL				3	19.5	6614			
CHLOROCOCCALEAN COLONY	COL						X			
CHLOROGONIUM	CEL						X			
COELASTRUM RETICULATUM	COL				1	4.3	1447			X
COELASTRUM SPHAERICUM	COL					0.3	103		0.5	28
COSMARIUM #1	CEL					0.3	103		1.4	84
COSMARIUM #2	CEL						X			X
CRUCIGENIA APICULATA	COL						X			
CRUCIGENIA QUADRATA	COL		0.5	43						
CRYPTOMONAS	CEL									X
CYANOPHYTAN COCCOID CELLED COLONY	CEL						X			
CYANOPHYTAN FILAMENT	FIL						X			
CYANOPHYTAN FILAMENT #1	FIL					3.0	1030			X
CYANOPHYTAN FILAMENT #2	FIL								8.0	476
CYCLOTELLA	CEL		1.5	129						
CYCLOTELLA #1	CEL									X
CYCLOTELLA #2	CEL								6.1	364
CYCLOTELLA STELLIGERA	CEL						X			
DACTYLOCOCCOPSIS	CEL				5	21.3	7233		6.1	364
DICTYOSPHAERIUM PULCHELLUM	COL		1.5	129					0.9	56
DINOBRYON BAVARICUM	CEL								2.8	168
DINOBRYON SERTULARIA	CEL			X						
DINOFLAGELLATES	CEL		1.0	86						
ECHINOSPHAERELLA ?	CEL					0.3	103			

LAKE NAME: WILLIAMS POND
STORET NUMBER: 1C09

CONTINUED

TAXA	FORM	04 10 73 S	04 10 73 %C	04 10 73 ALGAL UNITS PER ML	07 20 73 S	07 20 73 %C	07 20 73 ALGAL UNITS PER ML	09 28 73 S	09 28 73 %C	09 28 73 ALGAL UNITS PER ML
EUGLENA	CEL						X		1.4	84
EUNOTIA	CEL									X
FLAGELLATE ? #3	CEL			X						
FLAGELLATE #3	CEL	1	40.8	3438						
FLAGELLATES	CEL	4	15.3	1289	2	23.8	8060	2	24.9	1484
FRAGILARIA	CEL					0.3	103			
FRAGILARIA CROTONENSIS	CEL									X
GOLENKINIA RADIATA	CEL					0.6	207		2.8	168
GOLENKINIA RADIATA V. BREVISPINA	CEL					0.9	310			
GONIUM PECTORALE	COL									X
KIRCHNERIELLA	CEL		0.5	43						
KIRCHNERIELLA OBESA	CEL									X
LAGERHEIMIA LONGISETA	CEL									X
LUNATE CELLED COLONY	COL					0.3	103			
MELOSIRA #2	CEL	2	17.9	1504			X	1	7.5	448
MELOSIRA DISTANS	CEL			X					0.9	56
MERISMOPEDIA TENUISSIMA	COL								1.9	112
MICRACTINIUM PUSILLUM V. ELEGANS	COL									X
MICROCYSTIS AERUGINOSA	COL							5	1.9	112
MICROCYSTIS INCERTA	COL							4	6.1	364
NAVICULA	CEL	5	1.5	129			X			
NITZSCHIA	CEL					0.3	103			
OSCILLATORIA	FIL							3	13.6	812
OSCILLATORIA SUBTILISSIMA	FIL									X
PANDORINA MORUM	COL									X
PEDIASTRUM DUPLEX	COL									X
PEDIASTRUM DUPLEX V. GRACILIMUM	COL						X			
PEDIASTRUM DUPLEX V. RETICULATUM	COL									X

LAKE NAME: WILLIAMS POND
STORET NUMBER: 1C09

CONTINUED

TAXA	FORM	04 10 73 S	%C	ALGAL UNITS PER ML	07 20 73 S	%C	ALGAL UNITS PER ML	09 28 73 S	%C	ALGAL UNITS PER ML
PEDIASTRUM TETRAS										
V. TETRAODON	CCL					0.3	103			
PERIDINIUM INCONSPICUUM	CEL					1.3	430		0.9	56
PHACUS	CEL									X
PHACUS CURVICAUDA	CEL						X			X
PHACUS HELIKOIDES	CEL									X
PHACUS LONGICAUDA	CEL									X
PHACUS PYRUM	CEL									X
PHACUS SUECICUS	CEL									X
PINNULARIA	CEL								0.5	28
PINNULARIA ABAUJENSIS										
V. LINEARIS	CEL									X
PINNULARIA MESOLEPTA	CEL									X
RHIZOSOLENIA LONGISETA	CEL					0.3	103			
SCENEDESMUS	COL						X			
SCENEDESMUS ABUNDANS	COL						X		3.8	224
SCENEDESMUS ACUMINATUS	COL									X
SCENEDESMUS DENTICULATUS	CCL					0.3	103			
SCENEDESMUS DISPAR	COL								0.5	28
SCENEDESMUS ECORNIS										
V. DISCIFORMIS	COL					0.3	103			
SCENEDESMUS INTERMEDIUS	COL			X						
SCENEDESMUS OPOLIENSIS	COL					0.3	103			
SCENEDESMUS QUADRICAUDA	CCL		0.5	43			X		0.9	56
SCENEDESMUS SPP.	COL				4	15.2	5167			
SCHROEDERIA SETIGERA	CEL					0.6	207			X
SELENASTRUM WESTII	COL									X
STAURASTRUM	CEL			X						
STAURASTRUM #1	CEL								1.4	84
STAURASTRUM #2	CEL					0.3	103		0.5	28
STAURASTRUM #3	CEL					0.3	103			X
STAURASTRUM #4	CEL						X			

LAKE NAME: WILLIAMS POND
STORET NUMBER: 1009

CONTINUED

TAXA	FORM	04 10 73 S	%C	ALGAL UNITS PER ML	07 20 73 S	%C	ALGAL UNITS PER ML	09 28 73 S	%C	ALGAL UNITS PER ML
STAURASTRUM #5	CEL						X			
STAURASTRUM #6	CEL						X			
STAURASTRUM SETIGERUM	CEL						X			
SUPIRELLA BRIGHTWELLII ?	CEL			X						
SYNEDRA	CEL								3.3	196
SYNEDRA DELICATISSIMA	CEL		0.5	43						
TABELLARIA	CEL			X						
TETRAEDRON	CEL						X			
TETRAEDRON #1	CEL									X
TETRAEDRON HASTATUM	CEL									X
TETRAEDRON LIMNETICUM	CEL						X			X
TETRAEDRON MUTICUM	CEL					0.6	207			
TETRAEDRON TRIGONUM	CEL									X
TETRASTRUM HETERACANTHUM	COL								0.5	28
TREUBARIA	CEL									X
TREUBARIA TRIAPPENDICULATA	CEL					0.6	207			
TOTAL				8423			33904			5964

LAKE NAME: TRUSSUM POND
STORET NUMBER: 1010

NYGAARD TROPHIC STATE INDICES

DATE	07 20 73
MYXOPHYCEAN	0.12 ?
CHLOROPHYCEAN	0.31 ?
EUGLENOPHYTE	0/07 ?
DIATOM	0.25 ?
COMPOUND	0.62 O

PALMER'S ORGANIC POLLUTION INDICES

DATE	07 20 73
GENUS	00
SPECIES	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		07 20 73
AVERAGE DIVERSITY	H	3.07
NUMBER OF TAXA	S	43.00
NUMBER OF SAMPLES COMPOSITED	M	1.00
MAXIMUM DIVERSITY	MAXH	5.43
TOTAL DIVERSITY	D	4835.25
TOTAL NUMBER OF INDIVIDUALS/ML	N	1575.00
EVENESS COMPONENT	J	0.57
MEAN NUMBER OF INDIVIDUALS/TAXA	L	36.63
NUMBER/ML OF MOST ABUNDANT TAXON	K	361.00

LAKE NAME: TRUSSUM POND
STORET NUMBER: 1010

CONTINUED

07 20 73

TAXA	FORM	S	%C	ALGAL UNITS PER ML
ANABAENA	FIL			X
ANKISTRODESMUS	CEL		1.7	26
ANKISTRODESMUS CONVOLUTUS	CEL			X
CENTRIC DIATOM	CEL	5	4.9	77
COELASTRUM RETICULATUM	COL			X
COELASTRUM SPHAERICUM	COL			X
COSMARIUM #1	CEL	4	16.4	258
COSMARIUM #2	CEL			X
COSMARIUM MARGARITATUM	CEL			X
COSMARIUM ORTHOSTICHUM	CEL			X
CYMBELLA	CEL		3.3	52
CYMBELLA VENTRICOSA	CEL			X
DESMID #1	CEL			X
DESMID #2	CEL			X
DINOBRYON SERTULARIA	CEL			X
DINOFLAGELLATE	CEL	3	13.1	206
EUDORINA ELEGANS	COL			X
FLAGELLATES	CEL	2	22.9	361
FRAGILARIA	CEL			X
GONATOZYGON	CEL			X
GYROSIGMA	CEL			X
MELOSIRA #2	CEL			X
MELOSIRA #5	CEL			X
NAVICULA #1	CEL		1.7	26
NAVICULA #2	CEL			X
OSCILLATORIA	FIL			X
PENNATE DIATOM #1	CEL		3.3	52
PENNATE DIATOM #2	CEL		1.7	26
PINNULARIA	CEL			X
SCENEDESMUS	COL			X
SPONDYLOSIUM PLANUM	CEL	1	22.9	361
STAURASTRUM #1	CEL		1.7	26

LAKE NAME: TRUSSUM POND
STORET NUMBER: 1010

CONTINUED

TAXA	FORM	S	%C	07 20 73 ALGAL UNITS PER ML
STAURASTRUM #2	CEL			X
STAURASTRUM #3	CEL			X
STAURASTRUM #4	CEL			X
STAURASTRUM BIFICUM	CEL		1.7	26
STAURASTRUM CERASTES	CEL			X
STAURASTRUM DILATATUM V. HIBERNICUM	CEL			X
STAURASTRUM MUTICUM	CEL		1.7	26
STAURASTRUM SIMONYI ?	CEL			X
SYNEDRA	CEL			X
TABELLARIA FENESTRATA	CEL		3.3	52
TABELLARIA FLOCCULOSA	CEL			X
TOTAL				1575

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